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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/615,042	07/08/2003	Valeriy Sukharev	03-0509	3892

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LSI LOGIC CORPORATION
1621 BARBER LANE
MS: D-106 LEGAL
MILPITAS, CA 95035

EXAMINER

FENTY, JESSE A

ART UNIT	PAPER NUMBER
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2815

DATE MAILED: 06/17/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/615,042	Applicant(s) SUKHAREV ET AL	
	Examiner Jesse A. Fenty	Art Unit 2815	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 May 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-14 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-14 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1-3 and 5-11 are rejected under 35 U.S.C. 102(e) as being anticipated by Dubin et al. (US 2004/0000720 A1).

In re claims 1, 3 and 8, Dubin (Figs. 2a – 2c) discloses a device and method of forming an interconnect in a substrate (90) which includes one or more dielectric layers (100) and a copper deposit (195, section [0020]), said method comprising:

Forming a trench (205) in the substrate;

Forming a via in the substrate to the copper deposit;

Depositing (section [0027]) an intermediate liner layer (210) in the trench and via and on the copper deposit;

Depositing (section [0030]) an interconnect layer of aluminum-copper alloy (220, sections [0028 - 0029]) on the intermediate layer in the trench and via;

Depositing¹ copper (230) onto the aluminum-copper alloy interconnect line; and

¹ Dubin discloses depositing the copper layer (230) by electroplating (section [0041]). The reference discloses this to be a deposition method. Also see Graf, R., Modern Dictionary of Electronics, 1997, pp. 333, defining electroplating as a deposition method.

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Polishing the copper (section [0051]).

In re claim 2, Dubin discloses the method of claim 1, wherein the step of depositing a layer of aluminum-copper alloy comprises depositing the

In re claim 5, Dubin discloses the method of claim 3, wherein the step of depositing an intermediate liner layer comprises depositing Ta/TaN (section [0025]).

In re claim 6, Dubin (Figs. 2a – 2c) discloses an interconnect in a substrate which includes one or more dielectric layers (200), said interconnect comprising a first copper deposit (195), a second copper deposit (230), and an aluminum-copper alloy interconnect layer (220) disposed between and in (electrical) contact with the first and second copper deposits and between the second copper deposit and at least one of the dielectric layers.

In re claim 7, Dubin discloses the device of claim 6, wherein the aluminum-copper alloy interconnect liner has been deposited using a PVD technique.

In re claim 9, Dubin discloses the device of claim 8, wherein the aluminum-copper alloy interconnect liner has been deposited using a PVD technique.

In re claim 10, Dubin discloses the method of claim 8, wherein the intermediate interconnect liner comprises Ta/TaN.

In re claim 11, Dubin discloses the method of claim 1, further comprising depositing the interconnect layer such that said interconnect liner is in contact with the copper deposit.

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Claim Rejections - 35 USC § 103

1. Claims 4 and 12-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dubin as applied to claims 1, 3 and 8 above, and further in view of Moslehi (U.S. Patent No. 6,124,198).

3. In re claims 4 and 12-14, Dubin discloses the devices of claims 1, 3 and 8, but does not expressly disclose the aluminum-copper alloy comprising aluminum-0.5% copper alloy. However, such a combination of layers is a standard in the industry (Farrar; column 1, lines 65-67; column 2, lines 20-21) and it would have been obvious for one skilled in the art at the time of the invention to use Al-0.5% Cu alloy to line the trench of Lu for the purpose, for example, of improving the electro migration lifetime of the interconnect scheme (Moslehi; column 1, lines 32-38).

Response to Arguments

4. Applicant's arguments with respect to claims 1-14 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

5. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO**

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MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jesse A. Fenty whose telephone number is 571-272-1729. The examiner can normally be reached on 5/4-9 1st Fri. Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on 571-272-1664. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jesse A. Fenty
Examiner
Art Unit 2815


TOM THOMAS
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800